LETTERS TO THE EDITOR.

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Gauss and Non-Euclidean Geometry.

PROBABLY someone will before this have directed your attention to a statement in NATURE of June 30 regarding Gauss's share in the discovery of non-Euclidean geometry, but in case this may have escaped notice, even after the lapse of three months, I venture to bring it again before your readers. Speaking of Mannoury's book—"Methodologisches und Philosophisches zur Elementarmathematik"—"G. B. M." says "there is one remarkable statement made which deserves mention. Dr. Mannoury says that in December, 1818, F. K. Schweikart sent to Gauss a note asserting the existence of a geometry in which the sum of the angles of a triangle is less than two right angles, and in which the altitude of an isosceles triangle with a finite base has a finite upper limit. This goes far to demolish the claim made for Gauss that he was the first to assert the possibility of a consistent system of geometry distinct from Euclid."

The story of Gauss and the non-Euclidean geometry will probably always be incomplete, as he never published his investigations on this subject, and what is known of them has been gleaned from his correspondence and some notes only recently found among his papers (cf. Gauss, "Werke," Bd. viii., Leipzig, 1900). But neither Engel nor Stäckel—to whom we owe much of what has been written on the theory of parallels—nor any of the other writers on this phase of non-Euclidean geometry, have asserted that Gauss ever published any statement of his theory, large or small. The most that has been claimed for Gauss is that before Lobatschewsky, in 1826, and Bolyai, in 1832, published their statement of the geometry which will always be associated with their names, also even before Schweikart in 1818 had drawn up the note to which reference is made above, Gauss himself was convinced of the logical possibility of a geometry independent of the fifth postulate, and had mentioned many of his conclusions to his friends, verbally or in writing.

What happened with reference to Schweikart is well known. The whole story is to be found in Gauss's letter of 1819 to Gerling, by whom the memorandum had been submitted to Gauss at the request of the author. Like the subject of a recent political controversy, it could be written on half a sheet of notepaper; and it called forth from Gauss the warmest praise. With it he fully agreed. In fact, his results were exactly the same as those he had already obtained. His own work, he added, he had developed so far as to have fully solved all the problems of the new geometry. Some of his results he sent to Gerling to be communicated to Schweikart himself.

It is not of much importance whether before this date we have any reference to these investigations; but such is actually forthcoming in Wachter's letter to Gauss two years earlier, where he speaks of their conversation at Göttingen, and wonders "whether the anti-Euclidean geometry or your geometry is true."

And more valuable, as showing Gauss's real position, is his well-known letter to Wolfgang Bolyai in 1832, when he had received from him a copy of Johann's famous work:—"If I begin by saying that I cannot praise this work [of Johann's] you will assuredly be surprised for a moment. But I cannot say anything else. To praise it would be to praise myself. In fact, the whole contents of this work, the path which your son has followed, and the results to which he has been led, agree almost completely with my own meditations on this subject, some of them as old as thirty to thirty-five years."

This is but one of several statements of the same kind which we find in the correspondence of Gauss now available. Still, he would have been the last person to assert any claim for himself in the matter. Indeed, it was "a very great pleasure to him that it was actually the son of his old friend who had made this advance upon him in such a remarkable fashion." Yet there is ample evidence that the ideas contained in Schweikart's memorandum were already known to him, and that with much of the work of Lobatschewsky and Bolyai he was familiar long before they themselves had made these discoveries. To them belongs the independent discovery of their geometry, and its complete and systematic development. By their names it will always be called. To Schweikart, to a small extent, to Gauss to a much larger, can be given the credit of having realised that, along the path which Lobatschewsky and Bolyai travelled, complete success was bound to be achieved. H. S. CARSLAW.

The University, Sydney, August 10.

An Oblique Belt on Jupiter.

OWING in the main part to the swift axial rotation of the planet Jupiter, it is usual to find the dark belts, which constitute the principal configuration of his visible surface, lying both parallel to one another and to the planet's equator. An instance of obliquity of one of the bands relatively to the others is rare, and a most definite and striking example of the kind was recorded in the northern hemisphere in 1860. A recent phenomenon akin to this was observed in the spring months of the present year. Although in this case the band was a faint one, yet the marked trend which it exhibited called for special notice, and the more important facts relating to it might be briefly recorded here.

It attracted my attention, when engaged in a systematic study of the planet, first on April 1, and was subsequently observed on the following nights:—April 6, 8, 23, 28, May 2 and 7. After the last-mentioned date it was not seen again, partly on account of its growing faintness, and partly because the prevailing telescopic seeing was not inducive to a close scrutiny of the planet. During this observed interval a number of careful drawings of the region in question were executed, as well as a series of central-meridian transits of spots situated in and around the slanting belt. Some of these spots had been watched several months[1] prior to the appearance of this belt, so that the rotational velocity of the surface matter in this particular region was, on the whole, fairly accurately ascertained.

The oblique belt, which was a new formation, stretched itself across the white zone between the S. temperate and S.S. temperate belts. Nowhere, however, did it coalesce with these two belts, a point which can be better understood from the accompanying drawings than from a description alone. Its separate existence was due, evidently, to a repulsive action exerted upon it by the belts, which seemed to form a barrier against any further displacement in latitude.

The region of the oblique belt could always be readily recognised, even under poor definition, by reason of an abnormal dark patch of matter which occupied the site where the oblique belt crossed over the central part of the zone in which it was situated. This patch presented a concave outline both east and west, and the oblique belt passed uninterruptedly through it. A white spot (*c*) preceded it, and a fainter one was at times seen on the following side. This curious patch became visible earlier than did the oblique belt, and its greater durability enabled it to remain in view long after the belt had ceased to be visible.

The quicker drift of the spots A and B relatively to E, F, and G will be noticed in the drawings. The dark patch, with its condensation D, was carried along at about the same rate of velocity as A and B, and all, therefore, participated in one and the same current. The white spot C drifted at the same rate as the spots E, F, G, and, as will be noted, it was being gradually overtaken by the dark patch. Thus we observe the relative movements of two independent currents. They disclosed the noteworthy fact that the dark patch was in reality a distended part of the current about A and B, having evidently forced its way northwards across the slower current round C to the spots E, F, G. The condensation D formed part of the oblique belt. Whether the rest of this belt participated in the quick current of A and B is not known; but if such was really the case, we have here at least a clue as to the cause of the curious trend of the belt. The material of a

[1] Opposition of Jupiter occurred on March 31, 1910.

quick current often trespasses upon a slower moving one, a fact which is manifested by wispy shadings and spots protruding considerably into an adjacent current. Such an intrusion of matter might have occurred in the region of the S.S. temperate belt, and by continuing its northerly course slowly but interruptedly, its rapid westerly drift combined would cause it to drift in a W.N.W. direction. The result would be for the matter to form a slanting streak across the disc, and it is possible, and not improbable, that the oblique belt under discussion has found its origin through a similar cause.

Tests for Colour-vision.

AN article in NATURE for August 18 deals aptly with the question of testing for colour-vision. It is to be hoped that the committee at present inquiring into the matter will advocate that testing should be carried out in future in conditions resembling as nearly as possible those on which seamen ordinarily follow their calling. It does not seem quite practical or fair to test indoors a man's ability to pick up lights in the open. The conditions of light inside and outside vary so much, as do those of inside and outside darkness. A sailor's business is not to match colours, but to pick up and distinguish instantly lights that may be seen, far or near, through varying conditions of atmosphere.

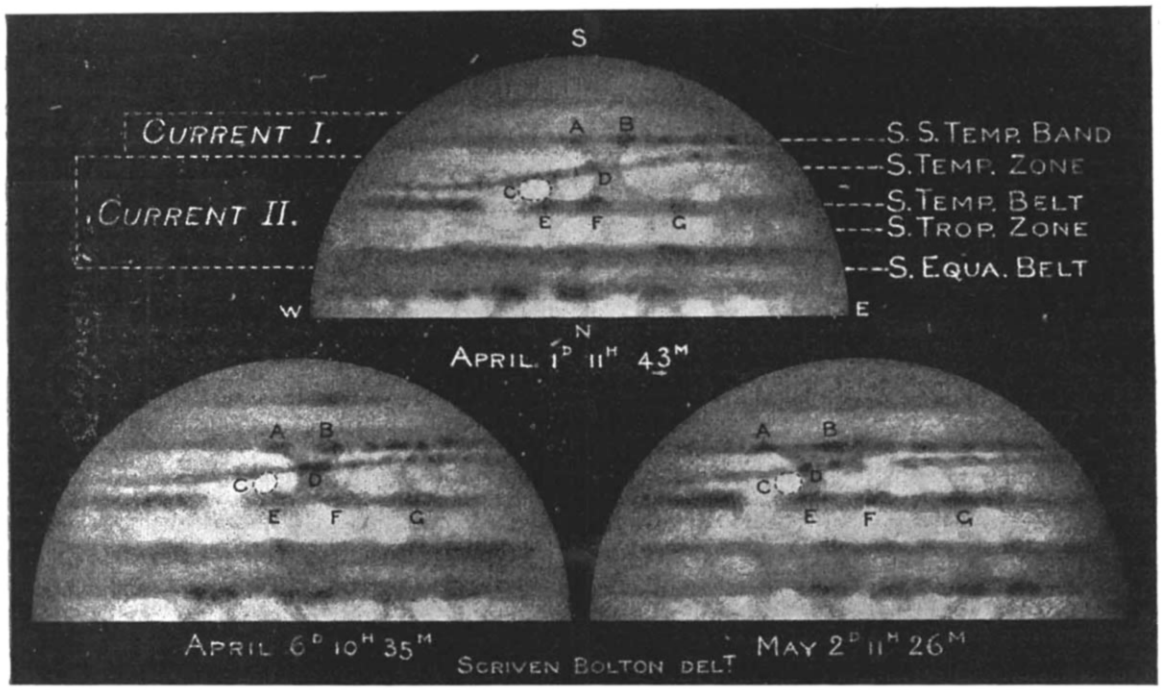
The sight of the average seaman, from practice, is probably much keener than that of the average landsman. The sailor's eyes are trained to adapt themselves to varying conditions of outside darkness.

The suggestion of spectrum tests is good, provided that such testing is made supplementary only to the practical open-air tests with flags by day and sidelights by night. The object of the tests is to ascertain the candidate's faculty for instant recognition of a flag or light, and there is no difficulty whatever in providing efficient practical tests. It is unnecessary, and even mischievous, to try to puzzle a candidate with combinations of lights and shades such as never occur in the course of his practical work.

It is to be hoped that the committee which is investigating the matter will allow common sense and practical ability to rule its recommendations for future examinations.

D. WILSON-BARKER.

The Thames Nautical Training College, H.M.S. *Worcester*, Greenhithe, September 19.



An Oblique Belt in Jupiter, 1910.

The movements of the seven spots lettered in the drawings are tabulated as under :—

Name of spot	First and last date of observation	Average monthly drift (3 days) [1]	Rotation period	
		°	h. m. s	
A	1910, Feb. 9 / 1910, May 7	+28·5	9 55 2·8	Current I.
B	1910, April 1 / 1910, May 7	+31·0	9 54 59·5	Current I.
D	1910, April 1 / 1910, May 7	+28·5	9 55 2·8	Current I.
C	1910, Jan. 16 / 1910, April 23	+17·0	9 55 18·1	Current II.
E	1910, March 5 / 1910, April 23	+15·8	9 55 19·7	Current II.
F	1909, Dec. 13 / 1910, April 23	+14·3	9 55 21·7	Current II.
G	1909, Dec. 30 / 1910, April 1	+17·5	9 55 17·4	Current II.

The oblique belt was situated on the opposite side of the planet to the red spot, and the longitudes of the condensation D might be given here :—

1910		1910	
April 1	169°·2	April 23	146°·9
,, 6	161·6	May 2	140·2
,, 8	156·1	,, 7	133·4

Leeds, September 3. SCRIVEN BOLTON.

[1] Relatively to the adopted zero meridian of System II., based on a rotation period of 9h. 55m. 40·6s. (*Nautical Almanac*).

Fireball of September 2.

THE remark in NATURE of September 8 (p. 318), as to the necessity of further observations for determining the height and velocity of meteors encourages me to send the following note :—

At 9.5 p.m. on September 2, from Earlstone Common, four miles south of Newbury, I had a good view of the meteor described by the Rev. J. C W. Herschel as seen